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Truck Crop Production Practices

YAKIMA COUNTY, WASHINGTON

Labor, Power, and Materials, by Operation

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Farm Production Economics Division
Economic Research Service
U. S. Department of Agriculture

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Crossley S-D Surveys, Inc., New York, N.Y., prepared the sample, conducted the field interviewing, and tabulated the statistical data under a contract with the U.S. Department of Agriculture.

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Previous publications in this group of reports on 1959 truck crop production practices covered the following areas:

Publication No.	Area Covered
ARS 43-132	Columbia County, Wis.
ERS-45	Accomack and Northampton Counties, Va.
ERS-79	Broward and Palm Beach Counties, Fla.
ERS-82	Colquitt County, Ga.
ERS-115	Cameron and Hidalgo Counties, Tex.
ERS-128	Imperial County, Calif.
ERS-129	Monterey County, Calif.
ERS-166	San Joaquin County, Calif.
ERS-169	Marion County, Oreg.

Washington, D. C. July 1964

HOW TO USE THE DATA

Different kinds of data are needed for different purposes. Some persons have need for data on average labor, power, and material inputs, while others, particularly county agents and farm budgeters, prefer data for usual or typical labor, power, and material inputs. The data in this report are presented in such a way as to satisfy both these needs.

Tables 1 and 2 contain information on the characteristics of farms in the sample. The remaining tables are for specific crops. There are four tables and a chart for each crop. These four sets of tables are not numbered in the usual way but are designated by the letters A, B, C, and D.

The tables lettered A present quantities and costs of materials used and of contract work hired per acre. Cost items included are direct costs only; they do not include charges for such items as land, overhead labor, and capital. Data that present only direct costs are somewhat limited in use. They are applicable in computing costs incurred in connection with crop insurance programs and are useful in partial farm budgeting to compare costs of producing alternative crops when charges for overhead labor, machinery, land, and so on, are the same for either crop and, hence, need not be taken into account.

These data are not appropriate and would be misleading for use as the sole criteria in judging whether or not a farmer made a profit on a crop or whether he should stay in business, or in making cost comparisons with crops grown in other areas. For these purposes, total costs are required.

Tables designated B present the various operations performed on the crops, the most common size of equipment used, the average number of times the operation was performed, the acreage covered, the man and power inputs per acre, and the total labor and power used per acre. These data do not reflect an accurate picture of operations or inputs on any one farm; they are averages of all operations and inputs.

Tables designated C present usual or typical labor and power inputs by operation. The accompanying charts show the seasonality of the operation by periods.

Tables designated D present for each operation the composition of the work force by major sources of workers.

Data in these tables were obtained from a sample of growers and are subject to sampling error. For some crops, particularly those having limited numbers of observations, large sampling errors are possible. Therefore, these data should be considered as approximations.

Tables A, B, and D are offered for those persons interested in average requirements. However, extension economists, county agents, farm budgeters, and others may have more use for the data on usual or typical situations shown in table C for each crop.

Farm labor placement officials and others concerned with the problem of obtaining and placing workers may find tables B and D and the charts of value in determining the number of workers necessary for each operation, and the period of time during which local seasonal workers and those from other areas will be needed to supplement the regular farm labor force.

TRUCK CROP PRODUCTION PRACTICES
YAKIMA COUNTY, WASHINGTON

Labor, Power, and Materials, by Operation

By

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INTRODUCTION

In 1963 U.S. production of truck crops for fresh market and processing occupied 3.3 million acres of cropland. These crops used slightly more than 1 percent of the total cropland. The farm value of truck crops harvested for sale exceeded $1.2 billion, or an average of $361 per acre harvested.1/

Although the total acreage of truck crops is small, it is highly concentrated in areas with conditions favorable for production of these crops. The major areas are in California, Florida, Texas, the Eastern Seaboard from Georgia to Long Island, N.Y., the States bordering the Great Lakes, and the Pacific Northwest.

Truck crops in general require intensive labor. These requirements are highly seasonal--with several labor peaks--the highest occurring at harvesttime.

Most truck-crop operations other than land preparation are difficult to mechanize. Thinning and weeding are two preharvest operations still performed largely by hand labor. Harvesting of a majority of truck crops is still predominantly a hand operation. Most of these crops require repetitive pickings, which must be timely, as quality deteriorates very rapidly if the crops are not harvested at the optimum time.

These high labor demands have been difficult to meet, particularly during peak periods of weeding, thinning, and harvesting. Most truck-crop areas do not have sufficient local labor available to handle the crops during these periods. This has led many thousands of workers to migrate from one area to another during the peak seasons.. In addition, many thousands of foreign workers are imported annually to help satisfy these heavy seasonal labor demands.

1/ U.S. Department of Agriculture Crop Reporting Board. Vegetables--Fresh Market 1963 Annual Summary--Acreage, Production, and Value of Principal Commercial Crops. Vg. 2-2-(63).

U.S. Department of Agriculture Crop Reporting Board. Vegetables--Processing 1963 Annual Summary--Acreage, Production, and Value of Principal Commercial Crops. Vg. 3-2-(63).

Purchased inputs comprise a high proportion of the total inputs in the production of these crops. Most labor is hired. Fertilizer, seed, pesticides, and containers are significant items that are usually purchased. From 1953 to 1962, prices of these inputs increased relative to prices received for truck crops.

To gain further knowledge of some of the inputs involved in production of vegetables, information regarding the 1958-59 crop was obtained from 2,496 vegetable growers in 12 areas.2/ The areas sampled were the counties of (1) Erie, N.Y., (2) Accomack and Northampton, Va., (3) Colquitt, Ga., (4) Broward and Palm Beach, Fla., (5) Cameron and Hidalgo, Tex., (6) Berrien and Van Buren, Mich., (7) Columbia, Wis., (8) Yakima, Wash., (9) Marion, Oreg., (10) Imperial, Calif., (11) Monterey, Calif., and (12) San Joaquin, Calif.

The areas included in the survey were selected on the basis of importance of seasonal and overall production, diversity of crops grown--both for fresh market and for processing--and number and proportion of farmers harvesting truck crops for sale.3/

The survey population was defined as all farmers producing truck crops for sale whose farm headquarters were located within the survey area, except those residing outside the county and more than 20 road miles from their headquarters in the survey area. Within the survey area, a randomized area sampling plan was used to obtain the desired number of respondents.

This is the 10th in a group of 12 publications containing information on labor requirements, production practices, and costs involved in the production of truck crops for fresh market and processing. Information in this report was obtained from 262 producers in Yakima County, Wash. The area studied is shown in figure 1.

A separate report covering all 12 areas presents information on the extent to which production of truck crops has become vertically coordinated by either ownership or contractual agreements.4/

2/ The Crossley S-D Surveys, Inc., under U.S. Department of Agriculture, Agricultural Research Service contract #12-14-100-3826 (43) conducted the field survey and made preliminary tabulations. The author is responsible for the analysis of the data.

3/ Based on U.S. Department of Commerce, Census of Agriculture, vols. I and II, 1954, and on the 1958 annual summaries of the series cited in footnote 1, p. 1.

4/ Mighell, Ronald L., Jones, Lawrence A., and Gavett, Earle E. Contract Production of Truck Crops, 12 Selected Areas, United States. ERS-152, U.S. Dept. Agr., March 1964.

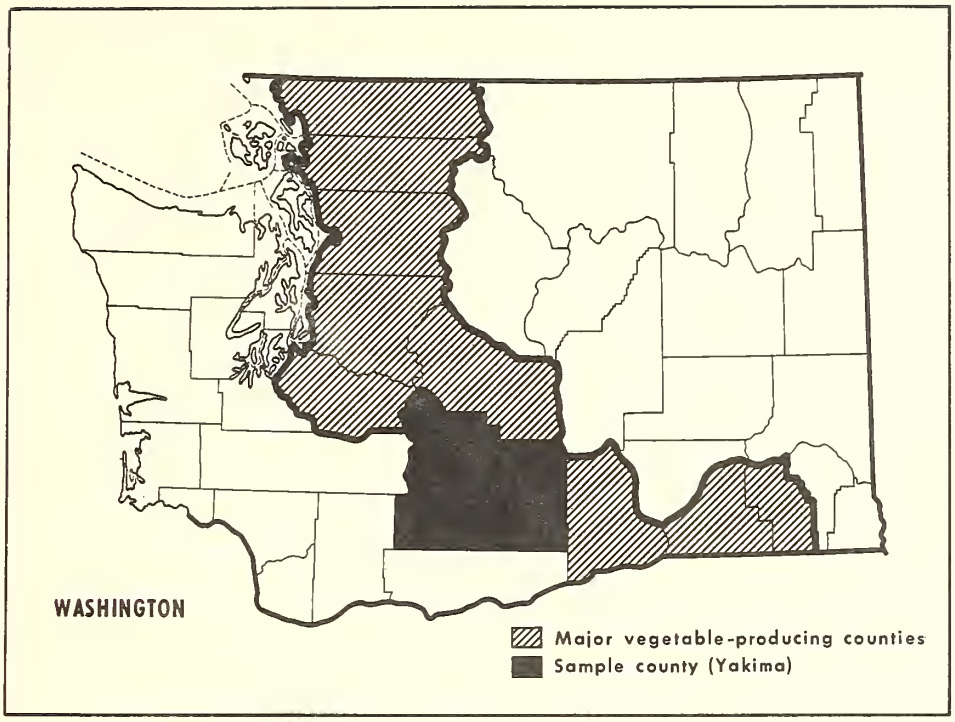


Figure 1

CHARACTERISTICS OF YAKIMA COUNTY, WASHINGTON

Vegetable production in the State of Washington has a farm value of $19 to $28 million annually. On the average, processing crops account for 70 percent of this value. The value of processing crops has increased from $10.7 million in 1954 to $20.2 in 1963, while returns for fresh market vegetables has remained rather constant.5/ Greater returns from processing crops have resulted chiefly from increased production of asparagus, sweet corn, and green peas.

Yakima is the leading vegetable-producing county in Washington. The 1959 census reported that 23,223 acres of vegetables on 939 farms were harvested for sale, the produce being valued at $4,163,611.6/ In the State vegetable industry, 32 percent of the vegetable farms, 21 percent of the vegetable acreage harvested, and 21 percent of the value of vegetable sales were in Yakima County.

Yakima County, located in the south-central part of the State, has extremely varied topography, soils, temperatures, and precipitation. Mount Adams, in the southwestern corner of the county, is the highest point, having an elevation of 12,307 feet. From this glaciated peak the land falls away to the northeast, to the great Yakima Valley (elevation 700 to 1,000 feet). Vegetable production in the county is located on the deep, fertile, irrigated land in the Yakima Valley. Precipitation is inadequate and ill-timed, occurring mostly during the winter months. Thus, all commercial vegetable production is irrigated.

5/ See footnote 1, p.1.
6/ U.S. Department of Commerce, Census of Agriculture, vol.1, pt.46, 1959.

According to the 1959 census, four truck crops were of prime importance in Yakima County--asparagus, sweet corn, green peas, and tomatoes. These four accounted for 91 percent of the total vegetable acreage. Asparagus was the number one crop, with 10,253 acres harvested; sweet corn followed with 8,224 acres, green peas with 1,525 acres, and tomatoes with 1,060 acres. The crops were used mainly for processing, yet substantial proportions were sold on the fresh market.

In the winter of 1959-60, information regarding the 1959 production of truck crops was obtained by interviewing operators of 262 farms. The survey farms represented a 28 percent sample of all farms harvesting truck crops for sale. The average survey farm had 83.9 acres of cropland. Vegetable production occupied 23.4 acres, or 28 percent of the total cropland. More than three-fourths of the farms grew only one truck crop, yet nearly 10 percent of them grew five or more truck crops (table 1).

As was indicated by the 1959 census, asparagus, sweet corn, green peas, and tomatoes were the major truck crops in the county. The acreage figures for these crops grown on the survey farms compare closely with those of the census. More than 80 percent of the acreage was reported as harvested for processing use (table 2).

This report presents information on the production and harvesting of six crops grown for fresh market and three for processing.

Table 1.--Sample farms: Number, average acreage of cropland, and distribution of truck crops produced by farms in each size group, Yakima County, Wash., 1959

Cropland operated (acres)	Farms in size groups	Average acreage of cropland per farm	Distribution of farms by number of crops produced								
			1	2	3	4	5	6	7	8	9
	Number	Acres	Farms	Farms	Farms	Farms	Farms	Farms	Farms	Farms	Farms
Under 15.0	1/ 34	8.3	29	2	---	---	---	2	---	---	---
15.0 to 29.9	53	20.4	46	4	2	---	---	1	---	---	---
30.0 to 49.9	61	37.9	52	2	---	---	1	2	2	---	2
50.0 to 99.9	58	72.1	35	9	2	---	1	2	3	4	2
100.0 to 149.9	21	126.5	16	3	---	1	---	1	---	---	---
150.0 to 299.9	20	207.0	12	5	2	---	---	---	---	1	---
300.0 and over	15	489.3	10	4	1	---	---	---	---	---	---
Total or average	1/ 262	83.9	200	29	7	1	2	8	5	5	4

1/ Includes one farm that grew 12 truck crops.

Table 2.--Truck crops grown for fresh market and for processing on 262 farms, by acreage harvested, Yakima County, Wash., 1959

Crop	Farms on which crops were grown for--		Acreage harvested			Average acreage harvested per farm		
	Fresh market	Processing	Fresh market	Processing	Total	Fresh market	Processing	Total
	Number	Number	Acres	Acres	Acres	Acres	Acres	Acres
Asparagus	---	179	---	2,858.4	2,858.4	---	16.7	16.7
Cantaloups	28	---	161.2	---	161.2	5.8	---	5.8
Sweet corn	32	41	249.2	1,778.0	2,027.2	7.8	43.4	28.6
Cucumbers	18	---	18.4	---	18.4	1.0	---	1.0
Lettuce	6	---	45.7	---	45.7	7.6	---	7.6
Dry onions	9	---	25.5	---	25.5	2.8	---	2.8
Green peas	2	10	1.2	285.0	286.2	.6	28.5	23.9
Sweet peppers	16	---	28.1	---	28.1	1.8	---	1.8
Tomatoes	29	8	212.6	76.0	288.6	7.3	9.5	8.0
Squash	19	1	45.4	12.0	57.4	2.4	12.0	2.9
Strawberries	7	---	29.2	---	29.2	4.2	---	4.2
Watermelons	23	---	109.7	---	109.7	4.8	---	4.8
Rutabagas	7	---	68.5	---	68.5	9.8	---	9.8
Other 1/	---	---	41.5	80.0	121.5	---	---	---
Total	---	---	1,036.2	5,089.4	6,125.6	---	---	---

1/ Includes for fresh market use: cabbage, carrots, beets, and eggplant; and for processing use: green lima beans, carrots, and pumpkin.

VEGETABLES FOR FRESH MARKET

Truck crops were classified as fresh market vegetables if they were intended for this purpose at time of planting and were sold as such at time of harvesting.

In this section, all crops were grown for the fresh market. Some offgrade or surplus production of tomatoes was sent to processing plants. However, yield, labor, and power inputs per acre reflect only that portion sold for fresh market use.

Cantaloups

Figure 2 and tables A, B, C, and D present data on the growing and harvesting of cantaloups from 62 acres on 11 farms. Yield per acre averaged 138.2 hundredweight of graded cantaloups.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was a 1- or 2-plow unit with a drawbar rating of less than 20 horsepower.

The growing of cantaloups on these farms is essentially a family operation. Except for hoeing, weeding, thinning, and hand planting, all preharvest operations were done by farm family workers. Local seasonal and domestic migratory workers predominated in picking cantaloups, but the farm family did the bulk of the sorting and packing.

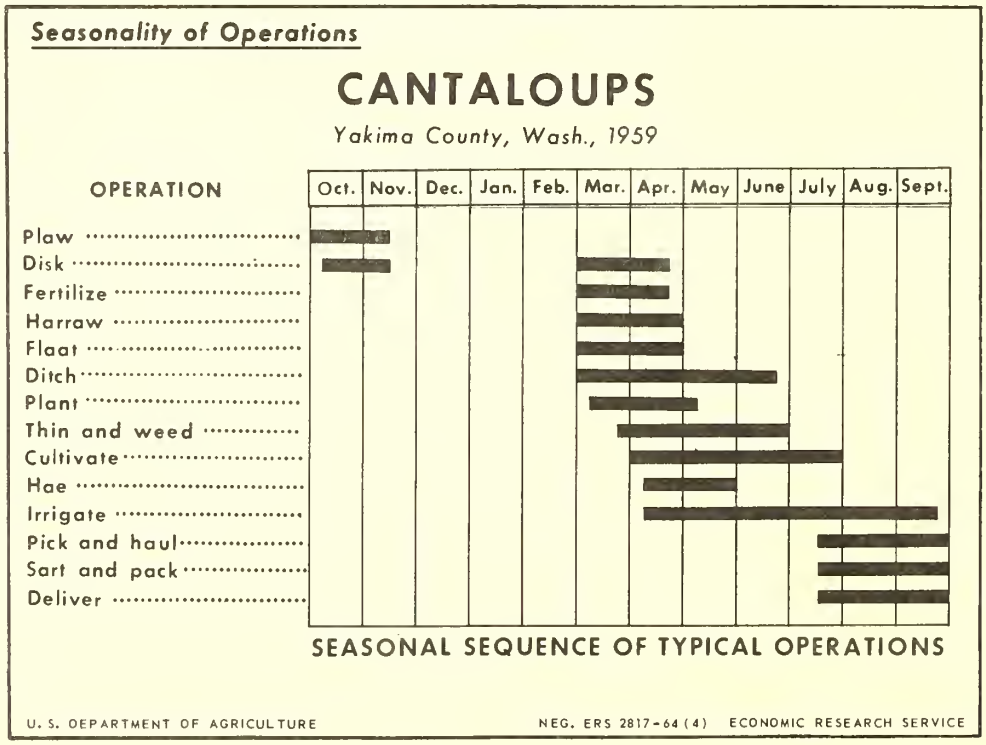


Figure 2

Table A.--Cantaloups: Materials used, averages for 62 acres on 11 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Seed	Pound	2.6	2.50	6.50	100	6.50
Fertilizer nutrients--						
N	Pound	49.9	1/			
P_2O_5	Pound	62.9	1/	16.01	85	13.61
K_2O	Pound	23.3	1/			
Manure	Ton	3.0	3.50	10.50	5	.52
Irrigation water	Acre	1.0	6.88	6.88	100	6.88
Picking sacks	Each	34.0	.09	3.06	100	3.06
Packing crates	Each	245.0	.43	105.35	100	105.35
Total	---	---	---	---	---	2/ 135.92

1/ Data not available.

2/ Average yield per acre--138.2 hundredweight. Average cost of materials per hundredweight--$0.98.

Table B.--Cantaloups: Labor, power, and machinery used in producing and harvesting, averages for 62 acres on 11 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Plow	1-bot. 16-in. moldbd.	2.4	2.4	1.0	100	2.4	2.4
Spread manure	60-bushel spreader	.7	.7	1.0	5	1/	1/
Disk	6-foot offset	1.1	1.1	2.0	90	2.0	2.0
Fertilize	10-foot spreader	1.3	1.3	1.3	69	1.2	1.2
Harrow	7-foot spiketooth	.8	.8	1.3	78	.8	.8
Float	7-foot float	.7	.7	1.2	93	.8	.8
Ditch	1-row ditcher	1.5	1.5	1.2	73	1.3	1.3
Plant	2-row planter	1.7	1.6	1.0	81	1.4	1.3
Plant	---	12.3	---	1.0	19	2.3	---
Thin and weed	---	24.5	---	1.0	76	18.6	---
Cultivate	1-row cultivator	2.2	2.2	6.1	75	10.1	10.1
Hoe	---	14.3	---	2.0	60	17.2	---
Weed	---	22.8	---	1.5	34	11.6	---
Irrigate	---	2.2	---	7.6	100	16.7	---
Cultivate and fertilize	1-row cult./attach.	1.3	1.2	1.0	19	.2	.2
Total	---	---	---	---	---	86.6	20.1
Harvest:							
Pick and haul	Truck	2.2	.4	15.0	100	33.0	6.0
Sort and pack	---	2.1	---	15.0	100	31.5	---
Deliver	Truck	.4	.4	15.0	100	6.0	6.0
Total	---	---	---	---	---	70.5	12.0
Total preharvest and harvest	---	---	---	---	---	2/ 157.1	2/ 32.1

1/ Less than 0.05 hour. 2/ Average yield per acre--138.2 hundredweight. Average labor and power used per hundredweight--1.14 hours and 0.23 hour, respectively.

Table C.--Cantaloups: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	2.4	2.4	2.4	2.4
Disk	2	1.1	1.1	2.2	2.2
Fertilize	1	1.3	1.3	1.3	1.3
Harrow	1	.8	.8	.8	.8
Float	1	.7	.7	.7	.7
Ditch	1	1.5	1.5	1.5	1.5
Plant	1	1.7	1.6	1.7	1.6
Thin and weed	1	24.5	---	24.5	---
Cultivate	6	2.2	2.2	13.2	13.2
Hoe	2	14.3	---	28.6	---
Irrigate	8	2.2	---	17.6	---
Pick and haul	15	2.2	.4	33.0	6.0
Sort and pack	15	2.1	---	31.5	---
Deliver	15	.4	.4	6.0	6.0
Total	---	---	---	165.0	35.7

Table D.--Cantaloups: Distribution of workers performing specified operations, by type of worker on 11 farms, Yakima County, Wash., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Plow	100	0	0	0
Spread manure	100	0	0	0
Disk	100	0	0	0
Fertilize	100	0	0	0
Harrow	100	0	0	0
Float	100	0	0	0
Ditch	100	0	0	0
Plant by machine	100	0	0	0
Plant by hand	75	0	0	25
Thin and weed	0	0	60	40
Cultivate	100	0	0	0
Hoe	64	9	18	9
Weed	29	43	21	7
Irrigate	80	0	20	0
Cultivate and fertilize	100	0	0	0
Pick and haul	30	8	33	29
Sort and pack	80	10	10	0
Deliver	100	0	0	0

Figure 3 and tables A, B, C, and D present data on the growing and harvesting of sweet corn for the fresh market on 159 acres on 16 farms in 1959. The average yield per acre was 185 crates, each containing 5 dozen ears--about 80 hundredweight.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was about a 2-plow unit with a drawbar rating of 15 to 20 horsepower.

Growers sometimes follow practices which are very expensive and not generally done unless they think such practices will give them an edge over a competitor, either from a quantity or quality standpoint. For instance, nearly half the acreage of sweet corn for fresh market had sucker growth removed by hand. This practice generally produces no significant results, and therefore is a waste of valuable labor.7/ Where done, suckering required nearly 32 hours per acre.

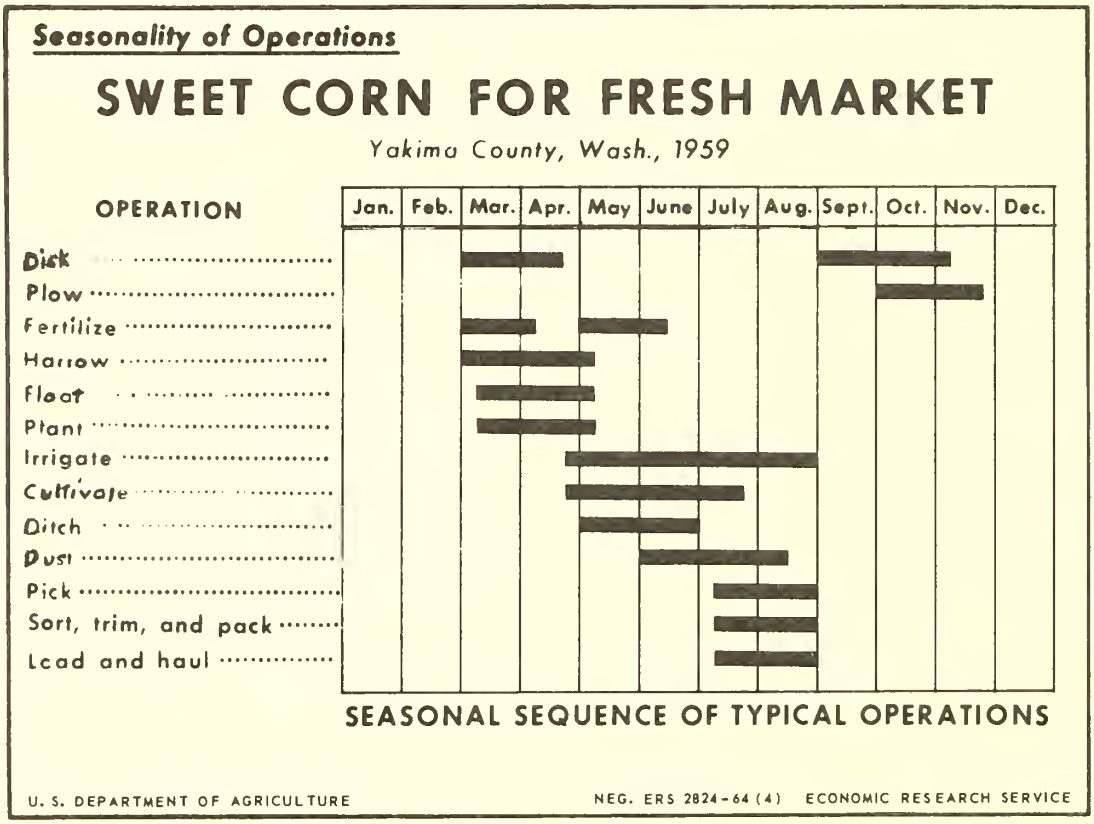


Figure 3

7/ Shoemaker, J. S. Vegetable Growing. John Wiley & Sons, Inc., N.Y. May 1949.

Table A.--Sweet corn: Materials used and contract work hired, averages for 159 acres on 16 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Fertilizer nutrients--						
N	Pound	87.1	1/	16.86	91	15.34
P_2O_5	Pound	33.0	1/			
K_2O	Pound	10.0	1/			
Seed	Pound	11.9	.57	6.78	100	6.78
Irrigation water	Acre	1.0	6.33	6.33	100	6.33
Spray, DDT	Application	1.0	1.80	1.80	16	.29
Dust	Pound	120.0	.25	30.00	8	2.40
Picking sacks	Each	15.0	.12	1.80	43	.77
Crates	Each	185.0	.30	55.50	100	55.50
Total	---	---	---	---	---	87.41
Contract work hired:						
Spray by boom sprayer, includes material	Application	3.0	17.50	52.50	16	8.40
Spray by plane, includes material	Application	2.6	7.97	20.72	28	5.80
Dust by plane, includes material	Application	3.9	6.51	25.39	40	10.16
Total	---	---	---	---	---	24.36
Total materials and contract work	---	---	---	---	---	2/ 111.77

1/ Data not available. 2/ Average yield per acre--185 crates (5 dozen ears per crate). Average cost of materials and contract work per crate--$0.60.

Table B.--Sweet corn: Labor, power, and machinery used in producing and harvesting, averages for 159 acres on 16 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Disk	7-foot offset	1.2	1.2	1.8	89	1.9	1.9
Plow	2-bot. 16-in. moldbd.	1.8	1.8	1.0	100	1.8	1.8
Fertilize	10-foot broadcaster	1.0	1.0	1.2	78	.9	.9
Harrow	8-foot spiketooth	.9	.9	2.1	100	1.9	1.9
Float	8 x 16-foot float	1.0	1.0	1.3	55	.7	.7
Plant	2-row planter	1.3	1.3	1.0	100	1.3	1.3
Irrigate	---	2.4	---	5.3	100	12.7	---
Cultivate	2-row cultivator	1.9	1.9	2.4	100	4.6	4.6
Ditch	2-row ditcher	1.6	1.6	1.1	55	1.0	1.0
Weed and hoe	---	30.7	---	1.0	17	5.2	---
Cultivate and fertilize	2-row cult./attach.	1.1	1.1	1.0	13	.1	.1
Thin	---	26.0	---	1.0	8	2.1	---
Sucker	---	22.7	---	1.4	48	15.2	---
Spray (custom)	6-row boom sprayer	.4	.4	3.0	16	.2	.2
Spray	6-row boom sprayer	.4	.4	1.0	16	.1	.1
Spray (custom)	Plane	1/	1/	2.6	28	1/	1/
Dust (custom)	Plane	1/	1/	3.9	40	.1	.1
Dust	---	10.0	---	4.0	8	3.2	---
Total	---	---	---	---	---	53.0	14.6
Harvest:							
Pick	---	15.3	---	2.1	100	32.1	---
Sort, trim, and pack	---	11.1	---	2.1	100	23.3	---
Load and haul	Truck	1.6	1.6	2.1	100	3.4	3.4
Total	---	---	---	---	---	58.8	3.4
Total preharvest and harvest	---	---	---	---	---	2/ 111.8	2/ 18.0

1/ Less than 0.05 hour. 2/ Average yield per acre--185 crates (5 dozen ears per crate). Average labor and power used per crate--0.60 hour and 0.10 hour, respectively.

Table C.--Sweet Corn: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Disk	2	1.2	1.2	2.4	2.4
Plow	1	1.8	1.8	1.8	1.8
Fertilize	1	1.0	1.0	1.0	1.0
Harrow	2	.9	.9	1.8	1.8
Float	1	1.0	1.0	1.0	1.0
Plant	1	1.3	1.3	1.3	1.3
Irrigate	5	2.4	---	12.0	---
Cultivate	2	1.9	1.9	3.8	3.8
Ditch	1	1.6	1.6	1.6	1.6
Dust by plane	4	1/	1/	.1	.1
Pick	2	15.3	---	30.6	---
Sort, trim, and pack	2	11.1	---	22.2	---
Load and haul	2	1.6	1.6	3.3	3.2
Total	---	---	---	82.8	18.0

1/ Less than 0.05 hour.

Table D.--Sweet corn: Distribution of workers performing specified operations, by type of worker on 16 farms, Yakima County, Wash., 1959

Operation	Type of worker				
	Operator and unpaid family	Local seasonal	Domestic migratory	Foreign	Custom
	Percent	Percent	Percent	Percent	Percent
Disk	100	0	0	0	0
Plow	94	0	6	0	0
Fertilize	100	0	0	0	0
Harrow	100	0	0	0	0
Float	100	0	0	0	0
Plant	100	0	0	0	0
Irrigate	86	7	7	0	0
Cultivate	100	0	0	0	0
Ditch	100	0	0	0	0
Weed and hoe	17	22	61	0	0
Cultivate and fertilize	100	0	0	0	0
Thin	34	33	33	0	0
Sucker	5	38	57	0	0
Spray by boom sprayer	40	0	0	0	60
Spray by plane	0	0	0	0	100
Dust by plane	0	0	0	0	100
Dust by hand	0	60	40	0	0
Pick	4	28	46	22	0
Sort, trim, and pack	10	23	60	7	0
Load and haul	93	7	0	0	0

Rutabagas

Figure 4 and tables A, B, C, and D present data covering the growing and harvesting of rutabagas for the fresh market on 68 acres on 7 farms. The average yield per acre of topped rutabagas was 10.67 tons.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was about a 2-plow unit with a drawbar rating of 15 to 20 horsepower.

Rutabagas are not now widely grown in the United States. In 1959, only 24 carlots of turnips and rutabagas were shipped by rail.8/ While truck transportation of these commodities is very important, statistics on movement by truck are not available. Acreage, production, and value of such a minor crop as rutabagas are not reported by the Crop Reporting Board, Statistical Reporting Service, USDA.

The growing of rutabagas is largely a farm family enterprise, except for such labor-intensive jobs as hoeing, thinning, and harvesting, which required local seasonal and domestic migratory workers.

In growing this crop, producers did not take advantage of its need for substantial amounts of N and P_2O_5 to obtain heavy yields. Only 11 percent of the acreage was fertilized. While rutabagas were planted from March through July and harvested from June through November, 80 percent of the acreage was harvested late in October and throughout November. Figure 4 covers the entire range of any particular operation.

An attempt was made to mechanize harvesting on 8 percent of the acreage. Instead of handlifting and topping, a potato digger was used to lift the roots before topping by hand. The net effect was to increase the labor input, as topping required more time than when the roots were lifted by hand.

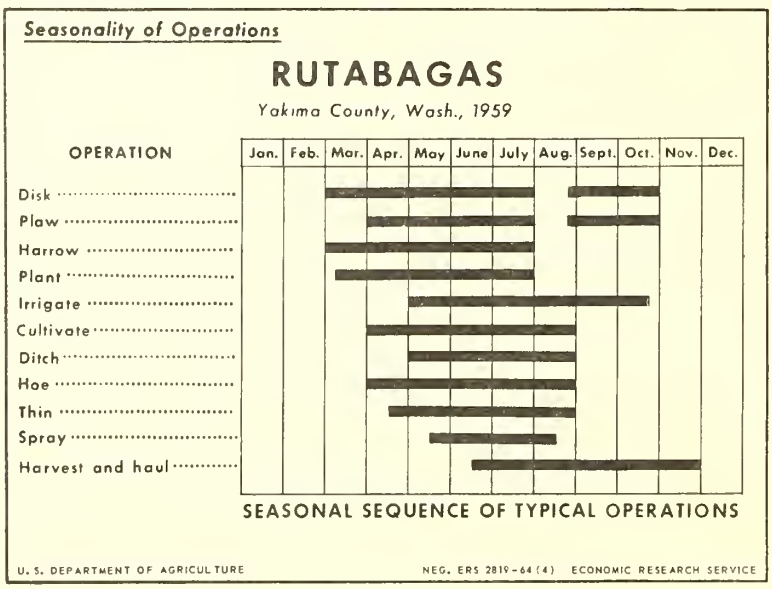


Figure 4

8/ U.S. Department of Agriculture, Agricultural Statistics 1962, table 373.

Table A.--Rutabagas: Materials used and contract work hired, averages for 68 acres on 7 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Seed	Pound	2.3	1.55	3.56	100	3.56
Fertilizer nutrients--						
N	Pound	100.0	1/	32.61	11	3.59
P_2O_5	Pound	127.1	1/			
K_2O	Pound	5.7	1/			
Irrigation water	Acre	1.0	4.06	4.06	100	4.06
Spray materials	Pound	1.5	5.13	7.70	22	1.69
Knives	Each	1.1	.66	.73	50	.36
Sacks	Each	201.0	.13	26.13	11	2.87
Total	---	---	---	---	---	16.13
Contract work hired:						
Spray by plane, includes spray-	Application	1.0	10.65	10.65	79	8.41
Load, haul, sort, and wash	Ton	12.0	4.75	57.00	79	45.03
Total	---	---	---	---	---	53.44
Total materials and contract work	---	---	---	---	---	2/ 69.57

1/ Data not available.

2/ Average yield per acre--10.67 tons. Average cost of materials and contract work per ton--$6.52.

Table B.--Rutabagas: Labor, power, and machinery used in producing and harvesting, averages for 68 acres on 7 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Plow	2-bot. 16-in. moldbd.	1.6	1.6	1.0	100	1.6	1.6
Disk	8-foot offset	.9	.9	3.0	71	1.9	1.9
Float	8 x 16-foot float	.7	.7	1.7	11	.1	.1
Harrow	9-foot springtooth	1.3	1.3	1.3	89	1.5	1.5
Pack and harrow	8-ft. cultipacker/ spiketooth	1.3	1.3	1.0	48	.6	.6
Fertilize	10-foot broadcaster	.7	.7	1.0	11	.1	.1
Plant	4-row planter	1.8	1.5	1.0	100	1.8	1.5
Irrigate	---	1.7	---	5.6	100	9.5	---
Cultivate	4-row cultivator	1.7	1.7	3.1	100	5.3	5.3
Ditch	4-row ditcher	1.0	1.0	1.0	82	.8	.8
Hoe	---	6.2	---	1.0	62	3.8	---
Thin	---	24.4	---	1.0	100	24.4	---
Cultivate and fertilize	4-row cult./attach.	1.0	1.0	1.0	8	.8	.8
Spray (custom)	Plane	.1	.1	1.0	79	.1	.1
Spray	6-row boom sprayer	1.1	1.1	1.0	22	.2	.2
Total	---	---	---	---	---	52.5	14.5
Harvest:							
Machine lift	2-row potato digger	9.6	4.8	1.0	8	.8	.4
Top and bag	---	198.0	---	1.0	8	15.8	---
Load and haul	Truck	12.0	4.0	1.0	8	1.0	.3
Lift and top	---	168.7	---	1.0	92	155.2	---
Load and haul	Truck	11.8	4.0	1.0	13	1.5	.5
Load, haul, sort, and wash (custom)	Truck, washer	19.7	4.0	1.0	79	15.6	3.2
Total	---	---	---	---	---	189.9	4.4
Total preharvest and harvest	---	---	---	---	---	1/ 242.4	1/ 18.9

1/ Average yield per acre--10.67 tons. Average labor and power used per ton--22.72 hours and 1.77 hours, respectively.

Table C.--Rutabagas: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Disk	3	0.9	0.9	2.7	2.7
Plow	1	1.6	1.6	1.6	1.6
Harrow	1	1.3	1.3	1.3	1.3
Plant	1	1.8	1.5	1.8	1.5
Irrigate	6	1.7	---	10.2	---
Cultivate	3	1.7	1.7	5.1	5.1
Ditch	1	1.0	1.0	1.0	1.0
Hoe	1	6.2	---	6.2	---
Thin	1	24.4	---	24.4	---
Spray (custom)	1	.1	.1	.1	.1
Lift and top	1	168.7	---	168.7	---
Load, haul, sort, and wash (custom)	1	19.7	4.0	19.7	4.0
Total	---	---	---	242.8	17.3

Table D.--Rutabagas: Distribution of workers performing specified operations, by type of worker on 7 farms, Yakima County, Wash., 1959

Operation	Type of worker		
	Operator and unpaid family	Local seasonal	Domestic migratory
	Percent	Percent	Percent
Plow	86	0	14
Disk	80	0	20
Float	100	0	0
Harrow	80	0	20
Pack and harrow	100	0	0
Fertilize	100	0	0
Plant	67	33	0
Irrigate	86	14	0
Cultivate	86	0	14
Ditch	80	0	20
Hoe	0	42	58
Thin	3	59	38
Cultivate and fertilize	100	0	0
Spray 1/	100	0	0
Machine lift	100	0	0
Top and bag	0	50	50
Load and haul	20	0	80
Lift and top	0	61	39
Load, haul, sort, and wash 1/	---	---	---

1/ Excludes custom operations.

Figure 5 and tables A, B, C, and D present data covering the growing and harvesting of summer-type squash for the fresh market from 15 acres on 7 farms in 1959. The average yield per acre was 116 hundredweight, or in a more commonly used term--193 crates (60 pounds per crate).

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was about a 2-plow unit with a drawbar rating of 15 to 20 horsepower.

The growing of summer-type squash is a family enterprise using little help outside the farm family. Small acreages, such as are reported here, are inefficient users of labor. On the average,2.3 hours were required to plow an acre with a single bottom 16-inch plow. This is nearly double the time that would be required with the same equipment on larger fields. Excessive time used for starting, stopping, and turning is evident on small plots.

Growers harvested their acreage an average of 8 times. Workers picked mature fruit, sacked, and carried it to the edge of the field. It was hauled by truck to the farm shed, sorted and packed into 60-pound crates, then loaded and trucked to market. The labor input in harvest appears excessive, but on these farms labor appears plentiful. Few of the harvest workers were other than farm family.

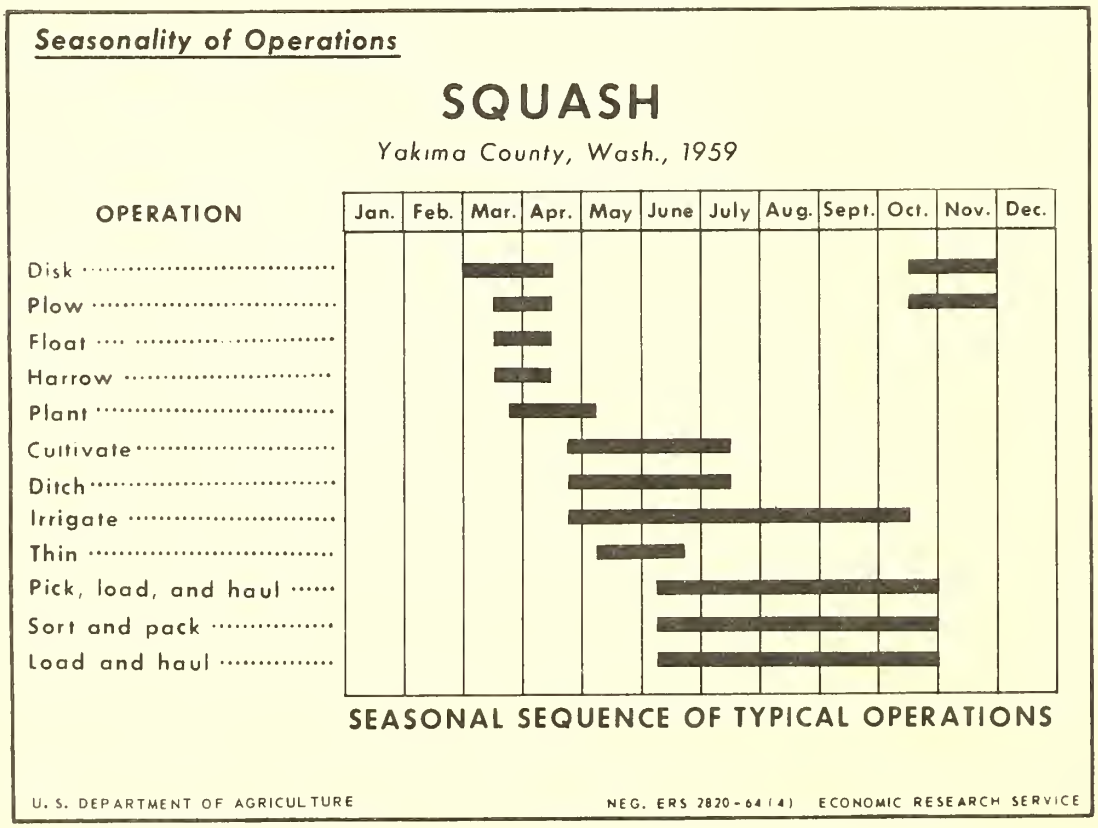


Figure 5

Table A.--Squash: Materials used, averages for 15 acres on 7 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Seed	Pound	2.6	2.51	6.53	100	6.53
Fertilizer nutrients--						
N	Pound	72.1	1/			
P_2O_5	Pound	33.1	1/	17.47	86	15.02
K_2O	Pound	22.4	1/			
Irrigation water	Acre	1.0	6.84	6.84	100	6.84
Spray materials	Pound	15.0	.50	7.50	7	.52
Dust materials	Pound	10.0	.14	1.40	14	.20
Picking sacks	Each	45.0	.10	4.50	100	4.50
Crates	Each	193.0	.46	88.78	100	88.78
Total	---	---	---	---	---	2/ 122.39

1/ Data not available.
2/ Average yield per acre--116 hundredweight. Average cost of materials per hundredweight--$1.06.

Table B.--Squash: Labor, power, and machinery used in producing and harvesting, averages for 15 acres on 7 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Disk	7-foot offset	1.3	1.3	1.8	86	2.0	2.0
Plow	1-bot. 16-in. moldbd.	2.3	2.3	1.0	100	2.3	2.3
Fertilize	10-foot broadcaster	1.2	1.2	1.0	38	.5	.5
Float	7 x 14-foot float	.9	.9	1.0	72	.6	.6
Harrow	8-foot spiketooth	.8	.8	1.0	86	.7	.7
Plant	2-row planter	1.9	1.9	1.0	72	1.4	1.4
Plant	---	10.0	---	1.0	28	2.8	---
Cultivate	2-row cultivator	1.7	1.7	3.8	100	6.5	6.5
Hoe	---	7.5	---	1.2	31	2.8	---
Ditch	2-row ditcher	1.1	1.1	3.8	100	4.2	4.2
Irrigate	---	1.0	---	16.5	100	16.5	---
Thin	---	12.7	---	1.0	72	9.1	---
Weed and thin	---	40.0	---	1.0	3	1.2	---
Weed	---	4.0	---	1.0	14	.6	---
Cultivate and fertilize	2-row cult./attach.	1.6	1.6	1.0	48	.8	.8
Dust	---	1.0	---	1.0	14	.1	---
Spray	---	10.0	---	1.0	7	.7	---
Total	---	---	---	---	---	52.8	19.0
Harvest:							
Pick, load, and haul	Truck	12.5	.8	8.0	100	100.0	6.4
Sort and pack	---	4.4	---	8.0	100	35.2	---
Load and haul	Truck	1.9	1.9	8.0	100	15.2	15.2
Total	---	---	---	---	---	150.4	21.6
Total preharvest and harvest	---	---	---	---	---	1/ 203.2	1/ 40.6

1/ Average yield per acre--116 hundredweight. Average labor and power used per hundredweight--1.75 hours and 0.35 hour, respectively.

Table C.--Squash: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Disk	2	1.3	1.3	2.6	2.6
Plow	1	2.3	2.3	2.3	2.3
Float	1	.9	.9	.9	.9
Harrow	1	.8	.8	.8	.8
Plant	1	1.9	1.9	1.9	1.9
Cultivate	4	1.7	1.7	6.8	6.8
Ditch	4	1.1	1.1	4.4	4.4
Irrigate	16	1.0	---	16.0	---
Thin	1	12.7	---	12.7	---
Pick, load, and haul	8	12.5	.8	100.0	6.4
Sort and pack	8	4.4	---	35.2	---
Load and haul	8	1.9	1.9	15.2	15.2
Total	---	---	---	198.8	41.3

Table D.--Squash: Distribution of workers performing specified operations, by type of worker on 7 farms, Yakima County, Wash., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Disk	100	0	0	0
Plow	100	0	0	0
Fertilize	100	0	0	0
Float	100	0	0	0
Harrow	100	0	0	0
Plant	100	0	0	0
Plant by hand	100	0	0	0
Cultivate	100	0	0	0
Hoe	60	40	0	0
Ditch	100	0	0	0
Irrigate	100	0	0	0
Thin	45	0	20	35
Weed and thin	100	0	0	0
Weed	100	0	0	0
Cultivate and fertilize	100	0	0	0
Dust	100	0	0	0
Spray	100	0	0	0
Pick, load, and haul	67	8	8	17
Sort and pack	75	13	0	12
Load and haul	100	0	0	0

Tomatoes

Figure 6 and tables A, B, C, and D present data on the growing and harvesting of tomatoes for the fresh market from 112 acres on 17 farms in 1959. The average yield per acre was 686 flats (18 pounds per flat), or 123.4 hundredweight. Excluded from this yield are the culls and other tomatoes which were sold to the processing plants.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was about a 2-plow unit with a drawbar rating of 15 to 20 horsepower.

The production of fresh market tomatoes required more than 300 hours of labor per acre. Nearly 100 hours were spent on preharvest operations. Irrigation, thinning, weeding, hoeing, and cultivating were the main labor-using operations.

In 1959, the tomato harvesting season averaged 54 days. Most growers harvested on an every-other-day basis. Nearly half the harvesting labor was spent on nonfield jobs of sorting, packing, and hauling to market. Field picking of tomatoes took about 1 hour per hundred pounds.

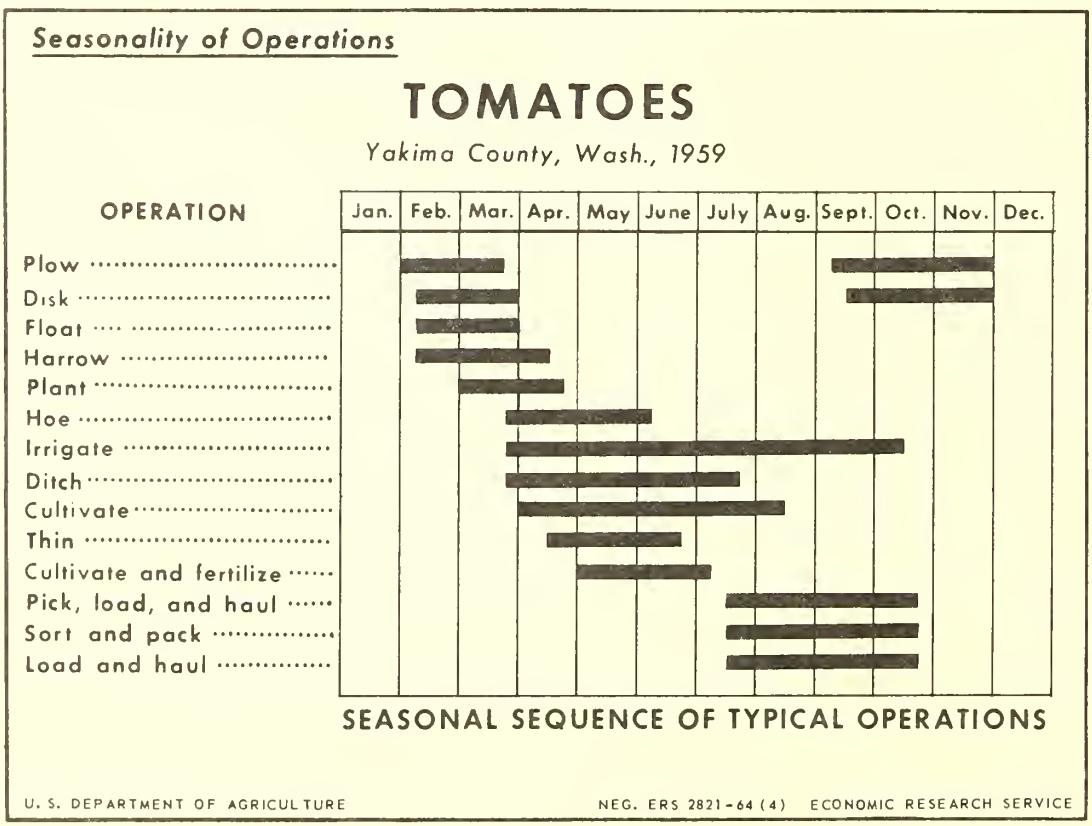


Figure 6

Table A.--Tomatoes: Materials used and contract work hired, averages for 112 acres on 17 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Seed	Pound	1.67	9.62	16.07	100	16.07
Fertilizer nutrients--						
N	Pound	33.2	1/	10.92	100	10.92
P_2O_5	Pound	30.4	1/			
K_2O	Pound	12.9	1/			
Irrigation water	Acre	1.0	6.54	6.54	100	6.54
Dust	Pound	24.2	.11	2.66	39	1.04
Picking boxes	Each	39.2	.33	12.94	80	10.35
Packing flats	Each	683.3	.22	150.33	87	130.79
Manure	Ton	3.0	3.50	10.50	4	.42
Total	---	---	---	---	---	176.13
Contract work hired:						
Spray by plane, includes materials	Acre	1.0	9.00	9.00	11	.99
Dust by plane, includes materials	Acre	1.0	6.00	6.00	14	.84
Total	---	---	---	---	---	1.83
Total materials and contract work	---	---	---	---	---	2/ 177.96

1/ Data not available.

2/ Average yield per acre--123.4 hundredweight. Average cost of materials and contract work per hundredweight--$1.44.

Table B.--Tomatoes: Labor, power, and machinery used in producing and harvesting, averages for 112 acres on 17 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Plow	1-bot. 16-in. moldbd.	2.5	2.5	1.0	100	2.5	2.5
Disk	6-foot offset	1.8	1.8	1.7	90	2.8	2.8
Float	7 x 14-foot float	1.3	1.3	1.0	81	1.1	1.1
Harrow	8-foot spiketooth	1.6	1.6	1.2	86	1.6	1.6
Fertilize	10-foot spreader	1.1	1.1	1.0	39	.4	.4
Spread manure	60-bushel spreader	1.2	1.2	1.0	4	1/	1/
Plant	2-row planter	1.9	1.9	1.0	96	1.8	1.8
Plant	---	10.0	---	1.0	4	.4	---
Hoe	---	8.7	---	1.5	62	8.1	---
Irrigate	---	1.5	---	11.5	100	17.2	---
Ditch	2-row ditcher	2.5	2.5	2.4	75	4.5	4.5
Cultivate	2-row cultivator	3.1	3.1	5.8	82	14.8	14.8
Thin	---	24.2	---	1.2	73	21.2	---
Dust	---	5.8	---	1.0	35	2.0	---
Cultivate and fertilize	2-row cult./attach.	3.1	3.1	1.2	57	2.1	2.1
Dust	2-row duster	.8	.8	2.0	4	.1	.1
Weed	---	17.9	---	1.8	37	11.9	---
Hill	2-row disk hiller	3.1	3.1	1.0	18	.6	.6
Dust (custom)	Plane	1/	1/	1.0	14	1/	1/
Spray (custom)	Plane	1/	1/	1.0	11	1/	1/
Total	---	---	---	---	---	93.1	32.3
Harvest:							
Pick, load, and haul	Truck	4.3	.3	27.0	100	116.1	8.1
Sort and pack	---	2.8	---	27.0	100	75.6	---
Load and haul	Truck	.7	.7	27.0	100	18.9	18.9
Total	---	---	---	---	---	210.6	27.0
Total preharvest and harvest	---	---	---	---	---	2/ 303.7	2/ 59.3

1/ Less than 0.05 hour.

2/ Average yield per acre--123.4 hundredweight. Average labor and power used per hundredweight--2.46 hours and 0.48 hour, respectively.

Table C.--Tomatoes: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	2.5	2.5	2.5	2.5
Disk	2	1.8	1.8	3.6	3.6
Float	1	1.3	1.3	1.3	1.3
Harrow	1	1.6	1.6	1.6	1.6
Plant	1	1.9	1.9	1.9	1.9
Hoe	1	8.7	---	8.7	---
Irrigate	12	1.5	---	18.0	---
Ditch	2	2.5	2.5	5.0	5.0
Cultivate	6	3.1	3.1	18.6	18.6
Thin	1	24.2	---	24.2	---
Cultivate and fertilize	1	3.1	3.1	3.1	3.1
Pick, load, and haul	27	4.3	.3	116.1	8.1
Sort and pack	27	2.8	---	75.6	---
Load and haul	27	.7	.7	18.9	18.9
Total	---	---	---	299.1	64.6

Table D.--Tomatoes: Distribution of workers performing specified operations, by type of worker on 17 farms, Yakima County, Wash., 1959

Operation	Type of worker					
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory	Foreign	Custom
	Percent	Percent	Percent	Percent	Percent	Percent
Plow	94	0	0	0	6	0
Disk	94	0	0	0	6	0
Float	94	0	0	0	6	0
Harrow	94	0	0	0	6	0
Fertilize	100	0	0	0	0	0
Spread manure	100	0	0	0	0	0
Plant	100	0	0	0	0	0
Plant by hand	100	0	0	0	0	0
Hoe	69	10	11	0	10	0
Irrigate	86	7	0	0	7	0
Ditch	84	8	0	0	8	0
Cultivate	93	0	0	0	7	0
Thin	38	5	12	21	24	0
Dust by hand	60	10	10	20	0	0
Cultivate and fertilize	0	100	0	0	0	0
Dust	100	0	0	0	0	0
Weed	45	10	10	10	25	0
Hill	67	33	0	0	0	0
Dust by plane	0	0	0	0	0	100
Spray by plane	0	0	0	0	0	100
Pick, load, and haul	31	1	24	24	20	0
Sort and pack	68	2	24	0	6	0
Load and haul	100	0	0	0	0	0

Figure 7 and tables A, B, C, and D present data covering production of watermelons from 70 acres on 7 farms in 1959. The average yield was 7.43 tons per acre.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was a 1- or 2-plow unit with a drawbar rating of less than 20 horsepower.

In 1959, watermelon prices declined to such a point that several growers reported that they stopped harvesting and left substantial production to rot in the fields. Had this production been harvested, the costs of materials and labor and power inputs per ton would have been lower than those shown in tables A and B.

Most of the labor input on this crop was by the farm family. However, hand operations, such as hoeing, thinning, weeding, and harvesting required outside help. Mexican nationals were important on these operations.

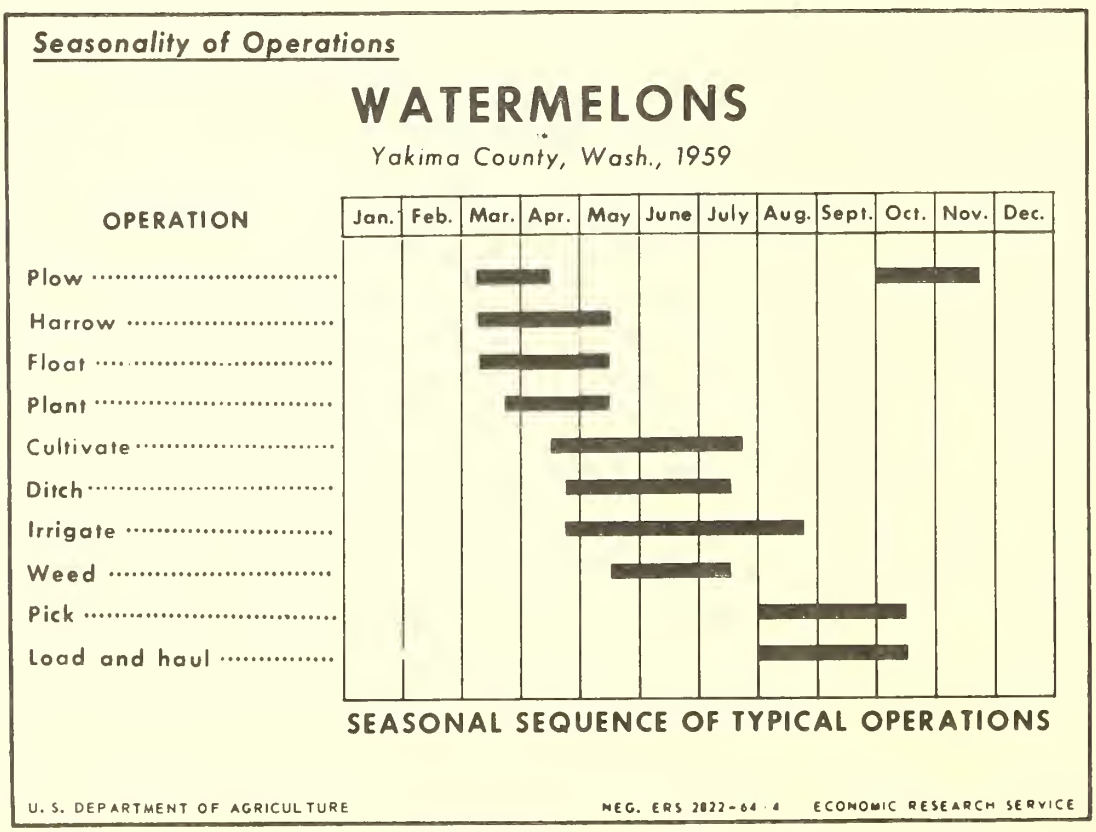


Figure 7

Table A.--Watermelons: Materials used, averages for 70 acres on 7 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Seed	Pound	2.25	2.53	5.69	100	5.69
Fertilizer nutrients--						
N	Pound	36.9	1/	9.35	40	3.74
P_2O_5	Pound	25.3	1/			
Irrigation water	Acre	1.0	6.31	6.31	100	6.31
Total	---	---	---	---	---	2/ 15.74

1/ Data not available.
2/ Average yield per acre--7.43 tons. Average cost of materials per ton--$2.12.

Table B.--Watermelons: Labor, power, and machinery used in producing and harvesting, averages for 70 acres on 7 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over: Man	Time per acre, once over: Power	Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage: Man	Time per acre, total acreage: Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Plow	1-bot. 16-in. moldbd.	1.8	1.8	1.0	100	1.8	1.8
Disk	7-foot offset	1.0	1.0	1.9	47	.9	.9
Harrow	8-foot spiketooth	.6	.6	1.9	100	1.1	1.1
Float	7 x 14-foot float	.6	.6	1.0	83	.5	.5
Plant	1-row planter	1.5	1.3	1.0	100	1.5	1.3
Fertilize	10-ft. distributor	.4	.4	1.0	23	.1	.1
Hoe	---	10.1	---	1.5	37	5.6	---
Cultivate	1-row cultivator	1.2	1.2	4.3	64	3.3	3.3
Ditch	1-row ditcher	1.2	1.2	2.3	51	1.4	1.4
Irrigate	---	.9	---	6.7	100	6.0	---
Thin	---	11.8	---	1.0	27	3.2	---
Weed	---	2.3	---	2.8	60	3.9	---
Total	---	---	---	---	---	29.3	10.4
Harvest:							
Pick	---	4.3	---	2.6	100	11.2	---
Load and haul	Truck	2.5	1.8	2.6	100	6.5	4.7
Total	---	---	---	---	---	17.7	4.7
Total preharvest and harvest	---	---	---	---	---	1/ 47.0	1/ 15.1

1/ Average yield per acre--7.43 tons. Average labor and power used per ton--6.33 hours and 2.03 hours, respectively.

Table C.--Watermelons: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	1.8	1.8	1.8	1.8
Harrow	2	.6	.6	1.2	1.2
Float	1	.6	.6	.6	.6
Plant	1	1.5	1.3	1.5	1.3
Cultivate	4	1.2	1.2	4.8	4.8
Ditch	2	1.2	1.2	2.4	2.4
Irrigate	7	.9	---	6.3	---
Weed	3	2.3	---	6.9	---
Pick	3	4.3	---	12.9	---
Load and haul	3	2.5	1.8	7.5	5.4
Total	---	---	---	45.9	17.5

Table D.--Watermelons: Distribution of workers performing specified operations, by type of worker on 7 farms, Yakima County, Wash., 1959

Operation	Type of worker				
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory	Foreign
	Percent	Percent	Percent	Percent	Percent
Plow	100	0	0	0	0
Disk	100	0	0	0	0
Harrow	100	0	0	0	0
Float	100	0	0	0	0
Plant	100	0	0	0	0
Fertilize	100	0	0	0	0
Hoe	10	20	30	0	40
Cultivate	100	0	0	0	0
Ditch	100	0	0	0	0
Irrigate	100	0	0	0	0
Thin	50	50	0	0	0
Weed	9	27	0	0	64
Pick	38	0	12	31	19
Load and haul	67	0	33	0	0

VEGETABLES FOR PROCESSING

This section contains information on the production and harvesting of three major processing crops grown in Washington--asparagus, sweet corn, and green peas.

Growers indicated that about 25 percent of the asparagus production was sold for fresh market use. However, the processor--not the grower--made the decision on market destination. Production practices were the same, regardless of the final use of the product.

In 1959, Washington ranked second in acreage and first in production of green peas for processing.9/ Yield per acre averaged 3,250 pounds. The green pea enterprise discussed in this report is atypical for the State because it is irrigated. The 1959 census reported only about 7 percent of the State green pea acreage was irrigated.

Asparagus

Figure 8 and tables A, B, C, and D present data on the growing and harvesting of asparagus for processing use from 2,764 acres on 171 farms in 1959. The average yield was 29.7 hundredweight per acre.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey. From the size of the equipment drawn by the tractor, it is assumed that the average tractor was about a 2-plow unit with a drawbar rating of 15 to 20 horsepower.

Tables A, B, C, and D and figure 8 present information only on the maintenance and harvest of asparagus from established beds. Not included are costs of establishing asparagus beds. Life of beds was not ascertained in this study, but growers in Yakima Valley have estimated the average life of asparagus beds to be 15 years.10/ For the first 2 years, no production is harvested. A light crop is cut the third year, but full-scale commercial harvesting begins with the fourth year after a bed is planted.

From the finish of harvest of the 1958 crop to the start of harvest of the 1959 crop, growers spent an average of 12.2 man- and 7.6 power hours per acre of asparagus bed. Irrigation required the largest single amount of labor--3.8 hours. Most of the remaining time was spent in controlling weeds and grass.

Harvesting of asparagus is quite time consuming. Yakima Valley growers generally provide a motorized platform, personnel carrier, or cart on which the cutters may lie in a prone position and cut asparagus spears. Workers, however, disdained using the carriers for other than transporting the cut spears, files, baskets, and so on. They did not use them for their intended purpose.

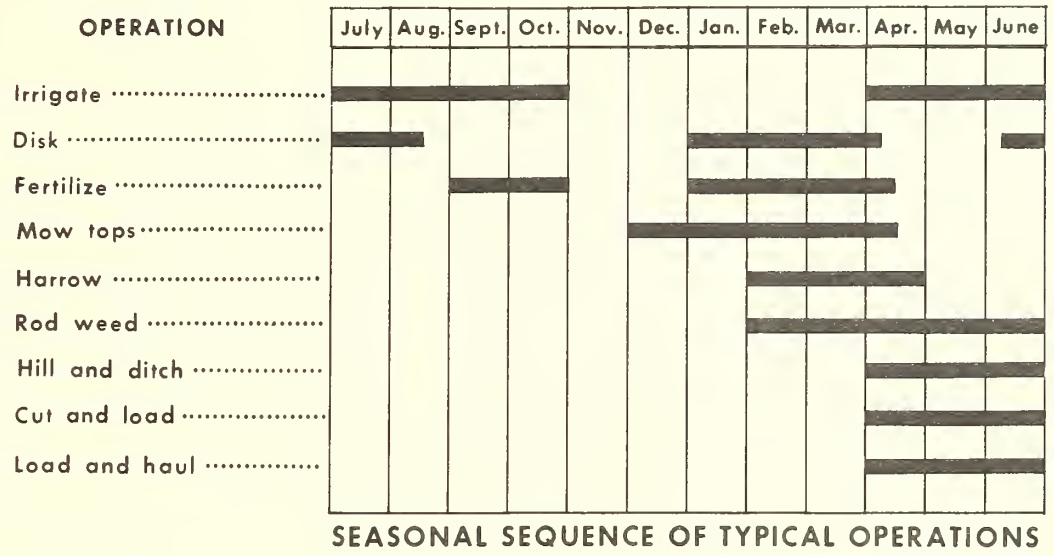
9/ Based on data in the 1959 annual summaries of the series cited in footnote 1, p. 1.

10/ Washington Agricultural Experiment Station. 1960 Estimated Cost of Producing Asparagus in Lower Yakima Valley. Sta. Cir. 389, June 1961.

Seasonality of Operations

ASPARAGUS

Yakima County, Wash., 1959



SEASONAL SEQUENCE OF TYPICAL OPERATIONS

U. S. DEPARTMENT OF AGRICULTURE NEG. ERS 2823-64 (4) ECONOMIC RESEARCH SERVICE

Table A.--Asparagus: Materials used and contract work hired, averages for 2,764 acres on 171 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Fertilizer nutrients--						
N	Pound	98.3	1/	14.33	77	11.03
P_2O_5	Pound	28.7	1/			
K_2O	Pound	.4	1/			
Manure	Ton	9.7	2.60	25.22	27	6.81
Irrigation water	Acre	1.0	6.25	6.25	100	6.25
Spray materials	Pound	2.9	1.41	4.09	10	.41
Spray materials	Pint	3.3	.92	3.04	23	.70
Knives	Each	1.6	1.56	2.50	42	1.05
Knife blades	Each	.9	.34	.31	100	.31
Files	Each	.6	.41	.25	100	.25
Pickers' belts and baskets	Each	1.0	1.66	1.66	5	.08
Total	---	---	---	---	---	26.89
Contract work hired:						
Spread manure, includes manure	Ton	15.0	3.00	45.00	1	.45
Mow tops	Acre	1.0	4.33	4.33	1	.04
Apply fertilizer, no materials	Acre	1.2	2.47	2.96	2	.06
Apply fertilizer, includes fertilizer	Acre	1.1	10.00	11.00	4	.44
Apply spray, no materials	Acre	1.1	2.82	3.10	4	.12
Apply spray, includes materials	Acre	1.1	6.64	7.30	6	.44
Cultivate	Acre	1.8	3.50	6.30	1	.06
Total	---	---	---	---	---	1.61
Total materials and contract work	---	---	---	---	---	2/ 28.50

1/ Data not available. 2/ Average yield per acre--29.7 hundredweight. Average cost of materials and contract work per hundredweight--$0.96.

Table B.--Asparagus: Labor, power, and machinery used in producing and harvesting, averages for 2,764 acres on 171 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Irrigate	---	1.0	---	4.1	92	3.8	---
Disk	6-foot tandem	1.0	1.0	1.8	90	1.6	1.6
Mow tops 1/	5-foot rotary mower	.9	.9	1.0	69	.6	.6
Spread manure 1/	60-bushel spreader	4.7	3.7	1.0	28	1.3	1.0
Fertilize 1/	2-row spreader	.7	.7	1.1	68	.5	.5
Harrow	8-foot spiketooth	.6	.6	1.3	50	.4	.4
Rod weed	12-foot rod weeder	.6	.6	1.7	53	.5	.5
Cultivate 1/	1-row cultivator	1.0	1.0	2.3	46	1.1	1.1
Weed and hoe	---	7.6	---	1.0	6	.5	---
Hill and ditch	1-row ditch hiller	.9	.9	1.9	100	1.7	1.7
Spray 1/	2-row boom sprayer	.5	.5	1.2	33	.2	.2
Total	---	---	---	---	---	12.2	7.6
Harvest:							
Cut and load by hand	Motorized carrier	1.8	.2	64.3	100	115.7	12.9
Load and haul	Truck	.1	.1	64.3	100	6.4	6.4
Total	---	---	---	---	---	122.1	19.3
Total preharvest and harvest	---	---	---	---	---	2/ 134.3	2/ 26.9

1/ Includes custom operations. 2/ Average yield per acre--29.7 hundredweight. Average labor and power used per hundredweight--4.52 hours and 0.91 hour, respectively.

Table C.--Asparagus: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Irrigate	4	1.0	---	4.0	---
Disk	2	1.0	1.0	2.0	2.0
Mow tops	1	.9	.9	.9	.9
Fertilize	1	.7	.7	.7	.7
Harrow	1	.6	.6	.6	.6
Rod weed	2	.6	.6	1.2	1.2
Hill and ditch	2	.9	.9	1.8	1.8
Cut and load by hand	64	1.8	.2	115.2	12.8
Load and haul	64	.1	.1	6.4	6.4
Total	---	---	---	132.8	26.4

Table D.--Asparagus: Distribution of workers performing specified operations, by type of worker on 171 farms, Yakima County, Wash., 1959

Operation	Type of worker					
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory	Foreign	Custom
	Percent	Percent	Percent	Percent	Percent	Percent
Irrigate	89	6	4	0	1	0
Disk	88	6	5	0	1	0
Mow tops	77	10	6	1	1	5
Spread manure	75	4	15	0	0	6
Fertilize	81	6	6	1	0	6
Harrow	89	7	4	0	0	0
Rod weed	81	12	5	1	1	0
Cultivate	82	11	3	1	0	3
Weed and hoe	61	0	15	24	0	0
Hill and ditch	88	6	4	1	1	0
Spray	56	16	3	0	0	25
Cut and load by hand	15	0	40	45	0	0
Load and haul	76	4	18	2	0	0

Figure 9 and tables A, B, C, and D present data covering the growing and harvesting of sweet corn for processing use from 1,621 acres on 38 farms in 1959. The average yield of ungraded sweet corn was 5.9 tons per acre.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was about a 2-plow unit with a drawbar rating of 15 to 20 horsepower.

Sweet corn growers were fairly well mechanized and performed no handwork on this crop, except in irrigating. While most growers themselves did not have all the machinery necessary for mechanically handling sweet corn, contractual arrangements with processors made specialized equipment available to the growers. For example, many growers did not even spray or dust their corn. However, the processors' field men observing the crops had substantial acreage sprayed or dusted to keep earworm infestations within limits.

In harvesting sweet corn, 98 percent of the acreage was machine picked by processor or custom-operator-owned cornpickers. Only 2 percent of the acreage was harvested by farmer-owned machinery. Hauling was contracted on only 13 percent of the acreage, as most growers had trucks and swapped work with neighbors to get a large enough truck crew to keep the pickers operating on a 24-hour-a-day schedule.

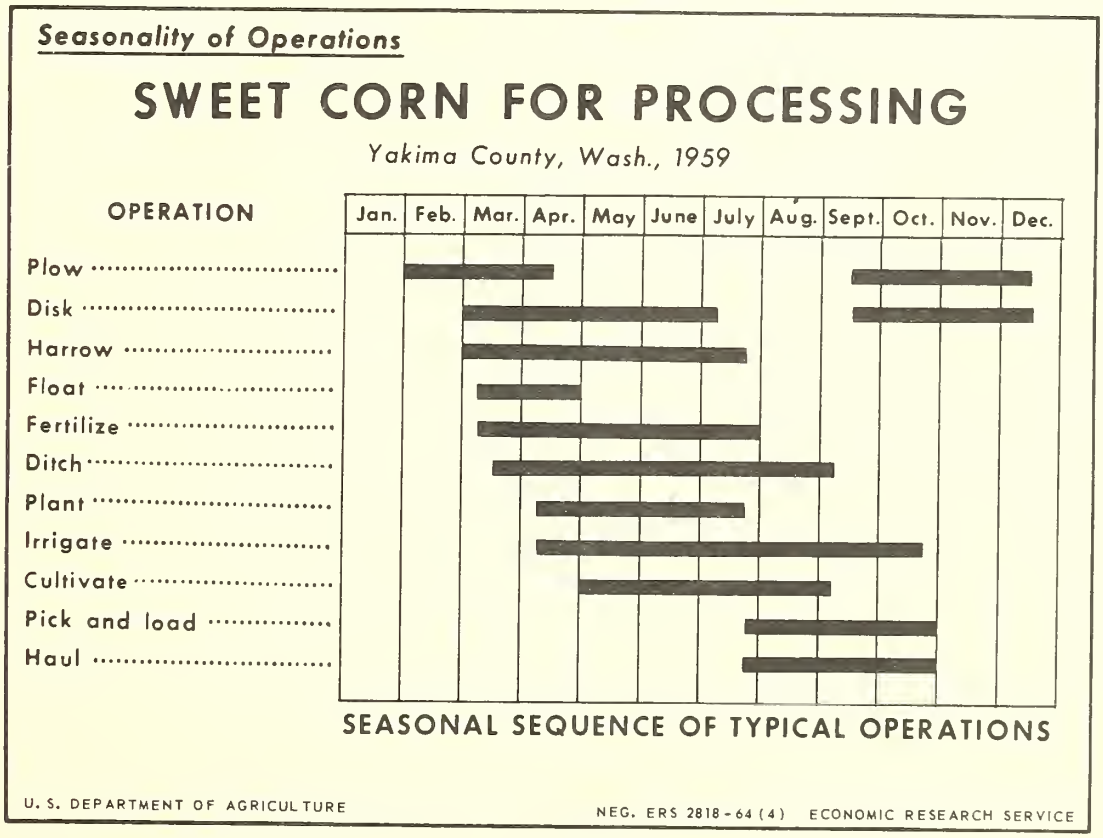


Figure 9

Table A.--Sweet corn: Materials used and contract work hired, averages for 1,621 acres on 38 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Seed	Pound	11.4	.42	4.79	100	4.79
Fertilizer nutrients--						
N	Pound	97.8	1/	15.95	75	11.96
P_2O_5	Pound	25.8	1/			
Irrigation water	Acre	1.0	6.06	6.06	100	6.06
Spray materials	Quart	.92	1.35	1.24	22	.27
Dust materials	Pound	4.54	.55	2.50	8	.20
Total	---	---	---	---	---	23.28
Contract work hired:						
Plow	Acre	1.0	5.00	5.00	2	.10
Apply fertilizer, no materials	Acre	1.0	2.00	2.00	6	.12
Apply fertilizer, includes materials	Acre	1.0	8.30	8.30	8	.66
Apply dust by plane, includes materials	Acre	1.6	5.34	8.54	8	.68
Apply dust by plane, no materials	Acre	1.0	2.74	2.74	8	.22
Apply dust by ground duster, includes materials	Acre	1.4	4.81	6.73	25	1.68
Spray by plane, no materials	Acre	1.0	2.50	2.50	8	.20
Spray by boom sprayer, no materials	Acre	1.0	2.01	2.01	10	.20
Spray by boom sprayer, includes materials	Acre	1.0	6.14	6.14	18	1.11
Harvest	Ton	5.9	2.65	15.64	98	15.33
Haul	Ton	5.6	2.28	12.77	13	1.66
Total	---	---	---	---	---	21.96
Total materials and contract work	---	---	---	---	---	2/ 45.24

1/ Data not available. 2/ Average yield per acre--5.9 tons. Average cost of materials and contract work per ton--$7.67.

Table B.--Sweet corn: Labor, power, and machinery used in producing and harvesting, averages for 1,621 acres on 38 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Chop tops	5-foot chopper	0.8	0.8	1.0	31	0.2	0.2
Plow 1/	2-bot. 16-in. moldbd.	1.2	1.2	1.0	96	1.2	1.2
Disk	8-foot offset	.7	.7	1.9	73	1.0	1.0
Harrow	10-foot spiketooth	.3	.3	3.1	94	.9	.9
Float	8 x 16-foot float	.4	.4	1.2	57	.3	.3
Fertilize 1/	4-row distributor	.4	.4	1.0	83	.3	.3
Ditch	4-row ditcher	.5	.5	1.4	57	.4	.4
Plant	4-row planter	.7	.7	1.0	100	.7	.7
Irrigate	---	.7	---	5.5	100	3.8	---
Cultivate	2-row cultivator	.7	.7	2.4	100	1.7	1.7
Spray 1/	8-row boom sprayer	.4	.4	1.0	41	.2	.2
Dust (custom)	4-row duster	.5	.5	1.4	25	.2	.2
Dust (custom)	Plane	2/	2/	2.6	8	2/	2/
Spray (custom)	Plane	2/	2/	1.0	8	2/	2/
Total	---	---	---	---	---	10.9	7.1
Harvest:							
Pick and load 1/	2-row cornpicker	2.2	2.2	1.0	100	2.2	2.2
Haul 1/	Truck	2.4	2.4	1.0	100	2.4	2.4
Total	---	---	---	---	---	4.6	4.6
Total preharvest and harvest	---	---	---	---	---	3/ 15.5	3/ 11.7

1/ Includes custom operations. 2/ Less than 0.05 hour. 3/ Average yield per acre--5.9 tons. Average labor and power used per ton--2.63 hours and 1.98 hours, respectively.

Table C.--Sweet corn: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	1.2	1.2	1.2	1.2
Disk	2	.7	.7	1.4	1.4
Harrow	3	.3	.3	.9	.9
Float	1	.4	.4	.4	.4
Fertilize	1	.4	.4	.4	.4
Ditch	1	.5	.5	.5	.5
Plant	1	.7	.7	.7	.7
Irrigate	6	.7	---	4.2	---
Cultivate	2	.7	.7	1.4	1.4
Pick and load	1	2.2	2.2	2.2	2.2
Haul	1	2.4	2.4	2.4	2.4
Total	---	---	---	15.7	11.5

Table D.--Sweet corn: Distribution of workers performing specified operations, by type of worker on 38 farms, Yakima County, Wash., 1959

Operation	Type of worker				
	Operator and unpaid family	Year-round hired	Local seasonal	Foreign	Custom
	Percent	Percent	Percent	Percent	Percent
Chop tops	70	10	20	0	0
Plow	83	6	10	0	1
Disk	82	9	9	0	0
Harrow	81	11	8	0	0
Float	72	14	14	0	0
Fertilize	64	7	7	4	18
Ditch	88	12	0	0	0
Plant	80	10	10	0	0
Irrigate	78	16	6	0	0
Cultivate	83	12	5	0	0
Spray by boom sprayer	40	0	10	0	50
Dust by ground duster	0	0	0	0	100
Spray by plane	0	0	0	0	100
Dust by plane	0	0	0	0	100
Pick and load	4	0	0	31	65
Haul	26	11	28	2	33

Green Peas

Figure 10 and tables A, B, C, and D present data covering the production and harvesting of green peas for processing use from 259 acres on 9 farms in 1959. The average yield per acre was 2.05 tons.

Tractors were the main source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained. From the size of the equipment drawn by the tractors, it is assumed that the average tractor was about a 2-plow unit with a drawbar rating of 15 to 20 horsepower.

Pea growers perform a minimum of operations on this crop. Excepting irrigation, growers performed an average of 5.1 hours of preharvest work per acre. On all acreage, the processor sent his crew in to harvest the crop. Prior to harvesting, the processor hired an airplane to spray chemical weedkiller on the borders of the fields where weeds generally penetrate first. No acreage studied was sprayed in its entirety. Growers would not estimate the cost of this border spraying as they had nothing to do with it.

Harvesting of the peas was performed by the processors' crews, using a 7-foot swather-loader, and sufficient trucks to haul the crop to the viner. The cost of the operation was based upon yield per acre. The first ton cost $28 to harvest; additional tons, $20.

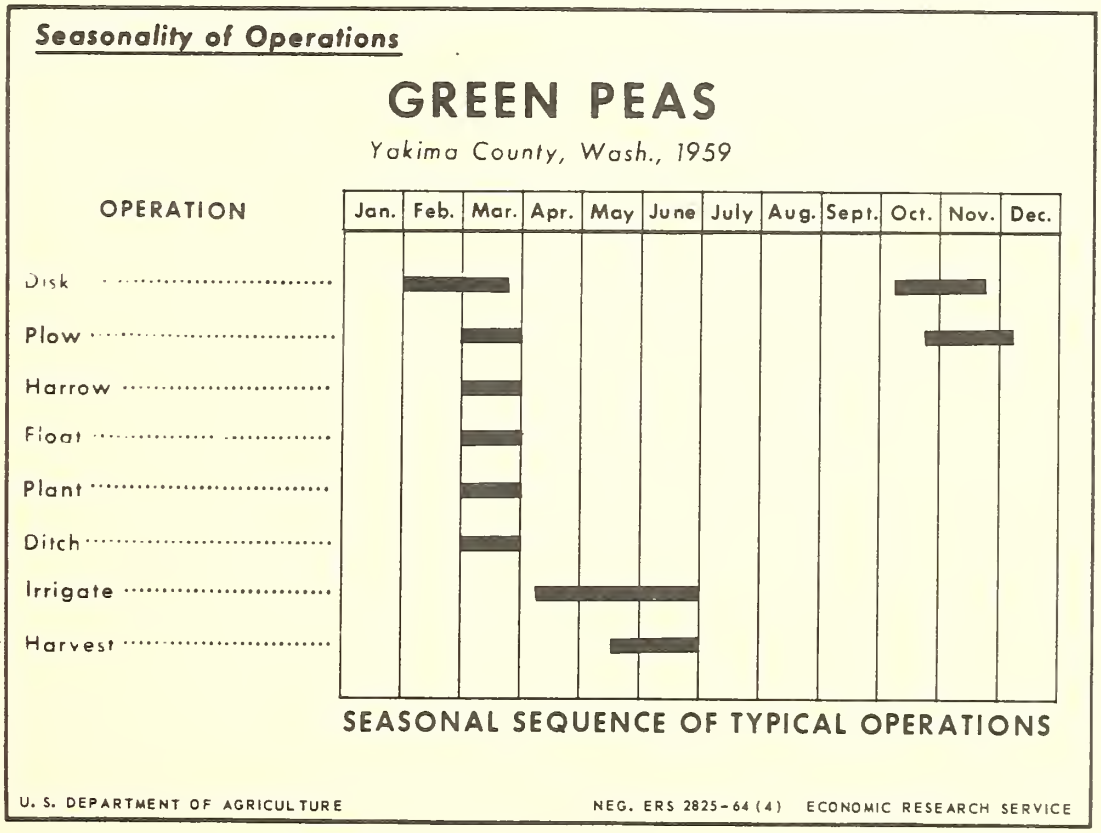


Figure 10

Table A.--Green peas: Materials used and contract work hired, averages for 259 acres on 9 farms, Yakima County, Wash., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Seed	Pound	278.4	.11	30.62	100	30.62
Fertilizer nutrients--						
N	Pound	8.5	1/	8.00	39	3.12
P_2O_5	Pound	32.5	1/			
Irrigation water	Acre	1.0	6.25	6.25	100	6.25
Total	---	---	---	---	---	39.99
Contract work hired:						
Harvesting	Ton	2.05	2/ 23.90	49.00	100	49.00
Total 3/	---	---	---	---	---	49.00
Total materials and contract work	---	---	---	---	---	4/ 88.99

1/ Data not available.

2/ Weighted price. Contracted price was $28 per acre for the first ton, then $20 per ton for any additional yield.

3/ Excludes border spraying done by the processor.

4/ Average yield per acre--2.05 tons. Average cost of materials and contract work per ton--$43.41.

Table B.--Green peas: Labor, power, and machinery used in producing and harvesting, averages for 259 acres on 9 farms, Yakima County, Wash., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Rotobeat	2-row rotobeater	1.3	1.3	1.0	10	0.1	0.1
Disk	8-foot offset	.7	.7	1.3	83	.8	.8
Plow	2-bot. 16-in. moldbd.	1.1	1.1	1.0	85	.9	.9
Fertilize	10-foot distributor	.6	.5	1.0	39	.2	.2
Harrow	12-foot spiketooth	.5	.5	1.9	95	.9	.9
Float	18-foot float	.6	.6	1.0	53	.3	.3
Cultipack	9-foot cultipacker	.7	.7	1.0	28	.2	.2
Plant	10-foot drill	.9	.7	1.0	100	.9	.7
Ditch	4-shovel ditcher	.8	.8	1.0	100	.8	.8
Irrigate	---	.6	---	8.8	100	5.3	---
Total	---	---	---	---	---	10.4	4.9
Harvest:							
Harvest (custom)	7-foot swather-	7.6	7.6	1.0	100	7.6	7.6
	loader, truck	7.6	7.6	1.0	100	7.6	7.6
Total	---	---	---	---	---	7.6	7.6
Total preharvest and harvest	---	---	---	---	---	1/ 18.0	1/ 12.5

1/ Average yield per acre--2.05 tons. Average labor and power used per ton--8.78 hours and 6.10 hours, respectively.

Table C.--Green peas: Usual labor and power inputs, Yakima County, Wash., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Disk	1	0.7	0.7	0.7	0.7
Plow	1	1.1	1.1	1.1	1.1
Harrow	2	.5	.5	1.0	1.0
Float	1	.6	.6	.6	.6
Plant	1	.9	.7	.9	.7
Ditch	1	.8	.8	.8	.8
Irrigate	9	.6	---	5.4	---
Harvest	1	7.6	7.6	7.6	7.6
Total	---	---	---	18.1	12.5

Table D.--Green peas: Distribution of workers performing specified operations, by type of worker on 9 farms, Yakima County, Wash., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Custom
	Percent	Percent	Percent	Percent
Rotobeat	100	0	0	0
Disk	73	27	0	0
Plow	50	25	25	0
Fertilize	75	25	0	0
Harrow	60	30	10	0
Float	43	43	14	0
Cultipack	75	25	0	0
Plant	64	18	18	0
Ditch	70	20	10	0
Irrigate	45	22	33	0
Harvest	0	0	0	100

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